

THAT WHICH IS CLAIMED:

1. An isolated nucleic acid molecule comprising one nucleotide sequence selected from the group consisting of:
 - 5 (a) the nucleotide sequence set forth in SEQ ID NO:1;
 - (b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:2;
 - (c) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide
10 sequence encodes a polypeptide having mannan synthase activity;
 - (d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having mannan synthase activity;
 - 15 (e) a fragment of the nucleotide sequence set forth in SEQ ID NO:1, wherein said fragment encodes a polypeptide having mannan synthase activity;
 - (f) a nucleotide sequence that is complementary to the nucleotide sequence of (a), (b), (c), (d), or (e);
 - 20 (g) the nucleotide sequence set forth in SEQ ID NO:3;
 - (h) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:4;
 - (i) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide
25 sequence encodes a polypeptide having galactosyltransferase activity;
 - (j) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having galactosyltransferase activity;

(k) a fragment of the nucleotide sequence set forth in SEQ ID NO:3, wherein said fragment encodes a polypeptide having galactosyltransferase activity; and

5 (l) a nucleotide sequence that is complementary to the nucleotide sequence of (g), (h), (i), (j), or (k).

2. An expression cassette comprising a nucleotide acid molecule of claim 1 operably linked to a promoter that drives expression in a host cell.

10 3. A vector comprising the expression cassette of claim 2.

4. A non-human host cell having stably incorporated in its genome the expression cassette of claim 2.

15 5. A plant cell having stably incorporated in its genome the nucleotide construct of claim 2.

6. A transformed plant comprising in its genome at least one stably incorporated nucleotide construct comprising a nucleotide sequence operably
20 linked to a promoter that is capable of driving expression in a plant cell, wherein said nucleotide sequence is selected from the group consisting of:

(a) the nucleotide sequence set forth in SEQ ID NO:1;

(b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:2;

25 (c) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide sequence encodes a polypeptide having mannan synthase activity;

(d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide

sequence, or complement thereof, encodes a polypeptide having mannan synthase activity;

(e) a fragment of the nucleotide sequence set forth in SEQ ID NO:1, wherein said fragment encodes a polypeptide having mannan synthase activity;

(f) a nucleotide sequence that is complementary to the nucleotide sequence of (a), (b), (c), (d), or (e);

(g) the nucleotide sequence set forth in SEQ ID NO:3;

(h) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:4;

(i) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence encodes a polypeptide having galactosyltransferase activity;

(j) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having galactosyltransferase activity;

(k) a fragment of the nucleotide sequence set forth in SEQ ID NO:3, wherein said fragment encodes a polypeptide having galactosyltransferase activity; and

(l) a nucleotide sequence that is complementary to the nucleotide sequence of (g), (h), (i), (j), or (k).

7. The plant of claim 6, wherein said plant comprises at least two of said nucleotide constructs.

8. The plant of claim 6, wherein said plant is a monocot.

9. The plant of claim 8, wherein said monocot is selected from the group consisting of maize, wheat, rice, sorghum, rye, millet, and barley.

10. The plant of claim 6, wherein said plant is a dicot.

11. The plant of claim 10, wherein said dicot is selected from the group
5 consisting of soybean, sunflower, safflower, alfalfa, potato, *Brassica* spp., cotton, tomato, tobacco, peanut, guar, locust bean, and fenugreek.

12. The plant of claim 6, wherein said promoter is selected from the
group consisting of constitutive, pathogen-inducible, chemical-regulated, wound-
10 inducible, and insect-inducible promoters.

13. A seed of the plant of any one of claims 6-12, wherein said seed
comprises in its genome at least one of said nucleotide constructs.

14. A method for altering the level of galactomannan in a plant, said
15 method comprising transforming a plant with a nucleotide construct comprising a nucleotide sequence operably linked to a promoter that is capable of driving expression in a plant cell, wherein said nucleotide sequence is selected from the group consisting of:

20 (a) the nucleotide sequence set forth in SEQ ID NO:1;
(b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:2;

(c) a nucleotide sequence having at least 80% identity to the
nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide
25 sequence encodes a polypeptide having mannan synthase activity;

(d) a nucleotide sequence that hybridizes under stringent conditions
to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide
sequence, or complement thereof, encodes a polypeptide having mannan
synthase activity;

(e) a fragment of the nucleotide sequence set forth in SEQ ID NO:1, wherein said fragment encodes a polypeptide having mannan synthase activity;

5 (f) a nucleotide sequence that is complementary to the nucleotide sequence of (a), (b), (c), (d), or (e);

(g) the nucleotide sequence set forth in SEQ ID NO:3;

(h) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:4;

10 (i) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence encodes a polypeptide having galactosyltransferase activity;

(j) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having
15 galactosyltransferase activity;

(k) a fragment of the nucleotide sequence set forth in SEQ ID NO:3, wherein said fragment encodes a polypeptide having galactosyltransferase activity; and

20 (l) a nucleotide sequence that is complementary to the nucleotide sequence of (g), (h), (i), (j), or (k).

15. The method of claim 14, wherein said method further comprises regenerating a stably transformed plant from said cell.

25 16. The method of claim 14, wherein said plant is a monocot.

17. The method of claim 16, wherein said monocot is selected from the group consisting of maize, wheat, rice, sorghum, rye, millet, and barley.

30 18. The method of claim 14, wherein said plant is a dicot.

19. The method of claim 17, wherein said dicot is selected from the group consisting of soybean, sunflower, safflower, alfalfa, potato, *Brassica* spp., cotton, tomato, tobacco, peanut, guar, locust bean, and fenugreek.

5

20. The method of claim 14, wherein said promoter is selected from the group consisting of constitutive, pathogen-inducible, chemical-regulated, wound-inducible, and insect-inducible promoters.

10

21. A method for producing gum comprising:

(a) obtaining a transformed plant, said transformed plant comprising in its genome a nucleotide construct comprising a nucleotide sequence encoding a mannan synthase, said nucleotide sequence operably linked to a promoter that is capable of driving expression in a plant cell;

15

(b) maintaining said transformed plant under conditions favorable for the production of gum in said transformed plant or in at least one part thereof;

(c) harvesting said transformed plant or said part; and

(d) extracting said gum from said plant or said part.

20

22. The method of claim 21, wherein said nucleotide sequence encoding a mannan synthase is selected from the group consisting of:

(a) the nucleotide sequence set forth in SEQ ID NO:1;

25 (b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:2;

(c) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide sequence encodes a polypeptide having mannan synthase activity;

30 (d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide

sequence, or complement thereof, encodes a polypeptide having mannan synthase activity; and

- (e) a fragment of the nucleotide sequence set forth in SEQ ID NO:1, wherein said fragment encodes a polypeptide having mannan synthase activity.

23. A method for producing gum comprising:

- (a) obtaining a transformed plant, said transformed plant comprising in its genome a first nucleotide construct and a second nucleotide construct,

said first nucleotide construct comprising a first nucleotide sequence encoding a mannan synthase, said first nucleotide sequence operably linked to a first promoter that is capable of driving expression in a plant cell,

- said second nucleotide construct comprising a second nucleotide sequence encoding a galactosyltransferase, said second nucleotide sequence operably linked to a second promoter that is capable of driving expression in a plant cell;

- (b) maintaining said transformed plant under conditions favorable for the production of gum in said transformed plant or in at least one part thereof;

(c) harvesting said transformed plant or said part; and

(d) extracting said gum from said plant or said part.

24. The method of claim 23, wherein said first nucleotide sequence is selected from the group consisting of:

(a) the nucleotide sequence set forth in SEQ ID NO:1;

(b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:2;

(c) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide sequence encodes a polypeptide having mannan synthase activity;

5 (d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:1, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having mannan synthase activity; and

(e) a fragment of the nucleotide sequence set forth in SEQ ID NO:1, wherein said fragment encodes a polypeptide having mannan synthase
10 activity.

25. The method of claim 23 or 24, wherein said second nucleotide sequence is selected from the group consisting of:

(a) the nucleotide sequence set forth in SEQ ID NO:3;
15 (b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:4;

(c) a nucleotide sequence having at least 80% identity to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having
20 galactosyltransferase activity;

(d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:3, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having galactosyltransferase activity; and

25 (e) a fragment of the nucleotide sequence set forth in SEQ ID NO:3, wherein said fragment encodes a polypeptide having galactosyltransferase activity.

26. The method of claim 23 or 24, wherein said second nucleotide
30 sequence is selected from the group consisting of:

- (a) the nucleotide sequence set forth in SEQ ID NO:5;
- (b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO:6;
- (c) a nucleotide sequence having at least 80% identity to the
5 nucleotide sequence set forth in SEQ ID NO:5, wherein said nucleotide sequence, or complement thereof, encodes a polypeptide having galactosyltransferase activity;
- (d) a nucleotide sequence that hybridizes under stringent conditions to the nucleotide sequence set forth in SEQ ID NO:5, wherein said nucleotide
10 sequence, or complement thereof, encodes a polypeptide having galactosyltransferase activity; and
- (e) a fragment of the nucleotide sequence set forth in SEQ ID NO:5, wherein said fragment encodes a polypeptide having galactosyltransferase activity.

15

27. The transformed plant of any one of claims 23-26.

28. A seed of the plant of claim 27, wherein said seed comprises in its genome said first and said second nucleotide constructs.

20

29. An isolated polypeptide comprising an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence set forth in SEQ ID NO:2;
- (b) an amino acid sequence having at least 80% identity to the
25 amino acid sequence set forth in SEQ ID NO:2, wherein said polypeptide has mannan synthase activity;
- (c) a fragment of the amino acid sequence set forth in SEQ ID NO:2, wherein said polypeptide has mannan synthase activity;
- (d) the amino acid sequence encoded by the nucleotide
30 sequence set forth in SEQ ID NO:1;

(e) the amino acid sequence set forth in SEQ ID NO:4;
(f) an amino acid sequence having at least 80% identity to the amino acid sequence set forth in SEQ ID NO:4, wherein said polypeptide has galacotsyltransferase activity;

5 (g) a fragment of the amino acid sequence set forth in SEQ ID NO:4, wherein said polypeptide has galacotsyltransferase activity; and

(h) the amino acid sequence encoded by the nucleotide sequence set forth in SEQ ID NO:3.

30. The method of claim 14, wherein said plant comprises a GDP-mannose
10 transporter polynucleotide in soybean selected from the group consisting of:

- (a) the nucleotide sequence set forth in SEQ ID NO: 9; and
(b) a nucleotide sequence encoding the amino acid sequence set forth in SEQ ID NO: 10.

15